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MASTER OF MILITARY STUDIES


THE WARPATH OF NATIONS:
AMERICAN NAVAL LOGISTICS IN THE NORTHERN CAMPAIGN OF 1776

SUBMITTED IN FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF MILITARY STUDIES

LCDR THOMAS W. SCHULTZ, SC, USN

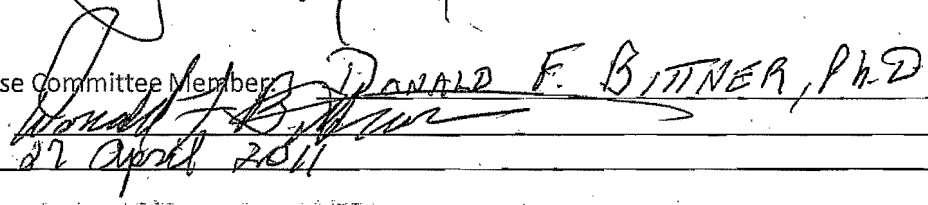
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Executive Summary

Title: The Warpath of Nations: American Naval Logistics in the Northern Campaign of 1776

Author: Lieutenant Commander Thomas W. Schultz, Supply Corps, United States Navy

Thesis: The Americans earned a logistical advantage over the British leading to their success during the Northern Campaign of 1776. American logistics success denied the British any strategic advance over the campaign season thus earning the Americans another year to re-organize and re-fit.

Discussion: The Northern Campaign of 1776, conducted by the Americans against the British, occurred between June and November in the Lake Champlain Region of New York. The British were attempting to mount an offensive campaign while the Americans were conducting a defensive campaign. The British initial objective was to engage the American army headquarters at Fort Ticonderoga. Their overall objective was to split the rebellious colonies in two with an army from Canada driving south and perhaps meeting elements of a British army moving north from New York.

Leading up to the campaign, the American army had retreated from Canada in the face of a newly arrived British fleet and army superior to the Americans. The American army was also decimated by a small pox outbreak. The campaign season consisted of an arms race as the belligerents each built several warships to combat the enemy. Shipbuilding and other preparatory and logistical efforts consumed most of the months available for campaigning. To complement their existing squadron of four ships, the Americans built and armed eight gondolas and four row galleys.

Based on an analysis using the contemporary Integrated Logistics Support Elements construct, the Americans earned logistics advantages that led to their strategic success.

The campaign climaxed at the Battle of Valcour Island on 11 October. During the battle and following naval actions through 13 October, the American fleet was defeated and largely destroyed. However, this tactical naval victory by the British occurred too late in the campaign season to have any strategic value. With the onset of winter, the British withdrew from the lake back to Canada on 2 November. This delay in the British advance gave the Americans an additional year to re-organize and re-fit.

Conclusion: The contemporary logistician can learn lessons from this campaign. The Americans' logistical position in the Northern Theatre in 1776 gave them operational advantages that the British were unable to counter. The Americans were able to frame the problem, choose the ground, identify solutions, and arrive at their desired end state: the successful defense of New York.

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Preface

My wife Eileen has been very patient with my new vocation as a full time student including trips away for study and evenings at home researching. My little children Thomas and Regan have spent less time with Daddy than I would have liked.

The Marine Corps University Foundation generously resourced a trip for field study and research to upstate New York and Vermont where I was able to walk the ground of the campaign and view archives of primary source material.

While on field study, I was assisted by a number of historians who spent generous amounts of time with me both in person during my site visits and through future correspondence. Mr. Dale Henry a shipwright and blacksmith of the Lake Champlain Maritime Museum in Vergennes, VT, sat with me for the better part of his workday. He discussed the challenges in building, sailing, living upon, and fighting a colonial gunboat, of which he has personal experience in *Philadelphia II*, a replica of the 1776 American gondola. Mr. Henry was clearly well read on the campaign and we were able to have refreshing conversations regarding it which steered me down scholarly roads that I may not have taken otherwise.

Mrs. Carol Greenough, Town of Whitehall, NY, Historian, spent part of her Sunday with me at the town's Skenesborough Museum discussing the infrastructure of the colonial settlement and shipyard. She also graciously shared with me a number of retail materials and publications free of charge which included accounts of the shipbuilding season of 1776 not found elsewhere.

Mr. Christopher Fox, Curator of Collections at the Pell Research Center at Fort Ticonderoga was very generous with his time during a visit to their archives. He shared with me potential sources of material at other locations and names of other interested scholars, some of whom I have been in contact with and have cited here. Thanks to all.

“The little Navy on Lake Champlain was wiped out, but never had any force, large or small, lived to better purpose or died more gloriously. That the Americans were strong enough to impose a capitulation of the British Army at Saratoga was due to the invaluable year of delay secured by their little Navy on Lake Champlain.” - Alfred Thayer Mahan, CAPT, USN 1890

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Situation: 18 June 1776, St. Jean's, Quebec

Benedict Arnold has earned a living at many vocations: private soldier, store owner, smuggler, apothecary, trader, sailor, master of his own merchant fleet of ships, and most recently, a Brigadier General in the Continental Army. A year ago, he led the first naval attack in American history at this place, taking as prizes a British armed sloop and several smaller ships without loss of life.¹ He led a band of soldiers through virgin wilderness to attack the Canadian citadel of Quebec and gallantly laid a siege through six winter months. During the climactic attack his beloved and capable commander, Major General Richard Montgomery, fell in battle. It was an heroic siege that five weeks ago was finally broken by an overwhelming force of men and ships just arrived from England. Against impossible odds, and relentlessly pursued, Arnold led the last remnants of his tattered army to this town. But he has done so under good order and has destroyed most of the boats and goods in Canada that could be of use to the enemy. Even in the past days, Arnold has had a British warship at the docks here dismantled, and its pieces numbered and shipped south into American lines.

It is now night. The town is put to the torch. The flames guide the enemy into St. Jean's. What remains of the Continental Army in Canada has been put in boats and has fled up the lake. One crew in a single boat has been ordered to remain behind. Now as the British advance guard is within musket shot, Arnold spurs his horse to the river bank. Once there, he shoots his horse with a pistol and orders his Lieutenant to do the same, lest they become of use to the enemy. He boards the boat. It is rowed south, into the darkness, the fires of St. Jean's a fading twilight. Arnold's antagonist, Governor Guy Carleton writes triumphantly back to London that he had cleared the last American rebel out of Quebec. Back came the response from the new Secretary of State for America, Lord George Germain: "I am sorry you did not get Arnold, for of all the Americans, he is the most enterprising and dangerous."²

Context

By the early summer of 1776, the Continental Army of the Northern Department, battered and broken by the small pox and the British Army, had found sanctuary in the ancient forts of upstate New York. In these posts, they found rest and succor, but only for a limited time. Their foe, with little fatigue, had driven them from Canada. The British Army stood ready to advance south against the Americans along the old Warpath of Nations at Lake Champlain.

The British had brought with them from England tools, men, and materials designed to launch a fleet of warships upon the lake. Standing in their way were four sundry American vessels of dubious abilities. Arnold recognized at once the requirement to build additional warships to match the shipbuilding efforts made by the British at the north end of the lake. The campaign

season thus consisted of an arms race on each side of the lake as the belligerents built, armed, and manned several warships to combat the enemy. These shipbuilding efforts consumed most of the months available for campaigning as well as most of the logistics assets.

The British planned an advance by Governor Guy Carleton's army moving south from Canada to join a potential army marching north from New York under Lord Sir William Howe, thus splitting the colonies in two. Major General Horatio Gates, the most senior American officer in the operational theatre, instructed Arnold that they were conducting a defensive campaign.³ The center of gravity of the Americans, and the British initial objective, was the eleven-thousand man American army garrisoned at Fort Ticonderoga.⁴

The Americans earned a logistical advantage over the British leading to their success during the Northern Campaign of 1776. American logistics success denied the British any strategic advance over the campaign season thus, earning the Americans another year to reorganize and refit.

The campaign climaxed in a naval engagement at the Battle of Valcour Island on 11 October. This was the singular naval action undertaken by the Americans during the Revolutionary War that had a direct strategic impact. It was also the first fleet action ever conducted by the United States Navy and the only one during the revolutionary war.

Introduction

To set the stage, the beginnings of the campaign will be reviewed. Then, the American logistics efforts during the campaign will be analyzed employing the modern Integrated Logistics Support (ILS) Elements to categorize their achievements and failures.⁵ ILS Elements are listed and defined in Appendix A. The outcome of the campaign will be briefly discussed followed by an analysis of the campaign's implications and lessons for the contemporary military logistician.

Appendix B depicts a timeline of key events during the campaign. First however, it is necessary to discuss the geography of the theatre so an appreciation of the logistical challenges of the belligerents can be gained.

Geography

The Northern Campaign of 1776 took place in the Lake Champlain Region of upstate New York and present day Vermont. The campaign area consisted of several rivers and lakes (the highways of the day), separated by short portages, which aligned south to north from New York to Montreal. From New York, the Hudson River flows from the north for a navigable distance of one hundred ninety miles (one hundred fifty of these miles are tidal). From the Hudson's head of navigation at Fort Edward, a seventeen mile military road headed north to Lake George. Lake George ran thirty-two miles north separated from Lake Champlain at Ticonderoga by a two mile portage. From Ticonderoga, Lake Champlain flowed seventy-five miles north to the head of the Richelieu River near the Canadian border. There were twenty lake level miles of the Richelieu downstream to St. Jean's. From there, the Richelieu flowed north for fifty miles of non-navigable rapids and falls before it met tidal water along the St. Lawrence River at Sorel, Quebec. It was (and is) common to describe events and locations on Lake Champlain as "up lake" in the southerly direction and "down lake" in the northerly direction.

The operational campaign area was known as "The Warpath of Nations" to the Iroquois, and had been employed by European armies as an invasion route for over a century.⁶ This "warpath" was essential as the Adirondack and Green Mountains flanking Lake Champlain were barriers to travel except for small bands of men familiar with the mountain wilderness. Lake Champlain, along with its outlet the Richelieu River, was one hundred twenty navigable miles long from Skenesborough (now Whitehall, NY) to St. Jean's. A ship sailing at a modest five knots could, if

unopposed and with a steady wind, negotiate its entire length in two days. Due to ice, the lake was not navigable in the winter months thereby limiting the campaign season to April through November.

Appendix C shows the strategic campaign area. The strategic setting included the area between New York and Montreal. Appendix D displays the operational campaign area which included the area between Fort Edward and St Jean's.

The Beginning of the Campaign

The American retreat from Canada in the spring of 1776 was due as much to the small pox as it was to British arms. The pox sickened over 3,000 men and killed hundreds.⁷ Fortunately, the orderly withdrawal conducted by Brigadier Generals John Sullivan and Benedict Arnold left nothing of value to the enemy. All items of value, particularly cannon and watercraft of every kind, were taken by the Americans into the Champlain Valley "leaving nothing but ruin behind."⁸ Every article that was carried or floated out of Canada reduced future American logistics challenges while adding to the logistical difficulties of the British. In contrast, most of the supplies of food sent from London for use by the British army that campaign season would be used instead to feed the cupboard bare civilian population of Quebec.

The British entered the campaign with high confidence. An invasion fleet and army had in less than three months driven the American armies out of Canada. Previous preparations had been made in Great Britain for a campaign upon Lake Champlain in 1776. Preparations included the pre-fabrication in Britain of twenty-four gun boats and a like number of provision carrying long boats to be shipped across the Atlantic and "carried over" to the lake. In addition, the British began a program of disassembling four Royal Navy vessels upon the St. Lawrence and hauling the frames overland to St Jean's to be reassembled and floated there.

The American withdrawal to the Upper Champlain valley resulted in a more advantageous logistics position. It reduced the length of their lines of communication to their principle source of supply: the farms, shops, and mills of the long settled Hudson Valley. The retreat also placed the Americans in familiar and friendly ground away from the intrigues and difficulties of operating on foreign soil.

The Americans had one distinct advantage at the beginning of the campaign. They had possession of four warships of various types afloat on the lake.⁹ The American squadron was a significant defensive asset as the larger British Army was forced to build ships of their own in order to transit the lake and mount an offensive. The Royal Navy squadron that had relieved Quebec in the spring possessed significant amounts of naval ordnance, naval stores, and trained seamen within Canada. Continental leaders knew of the construction of a British fleet upon the lake at St. Jean's to counter the American fleet.¹⁰ Therefore, the Americans could not be content with their existing small fleet. A shipbuilding program would have to commence in order to counter the British.

All logistical and shipbuilding effort in the Lake Champlain region had the benefit of a Continental Army whose command and control was linear and efficient. Brigadier General Benedict Arnold was the tactical commander and Commander of the Lakes.¹¹ He reported to the Commander at Ticonderoga, Major General Horatio Gates. He in turn reported to the Commander of the Northern Department, Major General Philip Schuyler. The Commander in Chief was General George Washington. All four men were known to each other and had mutual respect and admiration. (Gates was discreetly politicking for Schuyler's position. However, this would not become overt until the following campaign season.) Arnold's three seniors

recognized his unique maritime experience and abilities, and therefore, deferred to him on naval matters.

Each of these men were talented and adroit commanders and had unique talents not shared by the others. The mercurial Arnold was a cleaver tactician with vast experience on ships. Gates, the master organizer and trainer, was tasked with the re-creation of a battered and sick army. Schuyler, the aristocrat and diplomat, would ensure support for the Northern Department from Washington and Congress while negotiating for the neutrality of the Iroquois.¹² Yet each of these commanders had an eye and talent for logistics.

A noteworthy junior supply officer, Captain Richard Varick in Albany, was an unsung hero of the campaign. Employing skill sets that today are desired of a supply officer such as careful financial management and scrupulous government contracting he was able to push a significant amount of supply from the Hudson Valley into the operational theatre. As early as 2 May, while the American army was still laying siege to Quebec and before the British naval invasion force arrived from Britain, Varick was requisitioning naval stores from New York and New London to be shipped north to Lake Champlain. The types of naval stores Varick was requesting were not appropriate for small boats but could only be employed by larger ships of sail.¹³ By 5 June, Varick was sending for oakum, pitch, and junk from New York as well.¹⁴ Varick's foresight allowed for the building of additional warships on the Lake before any of his superiors, except Arnold, was discussing the need for them.

On the receiving end at Skenesborough was a civilian in charge of work progress by the name of Harmanus Schuyler. Harmanus Schuyler was what today would be referred to as part husbanding agent and part quality control officer. Employed in theatre since at least early February, he was appointed by letter on 7 June by Major General Schuyler (no relation) to

“proceed to Skenesborough... and take charge of the Carpenters, Ax-men, Teamsters & Blacksmiths at that place and do every Thing in your power to forward the Building of the Gundaloes.” (sic)¹⁵ That he was able to manage the hundreds of tradesmen in his charge, the procurement of supplies from elsewhere, and the construction of the fleet is testament to his efforts.

Design Interface

Recent marine archeology suggests that the gondolas were each built of the same size, shape, and dimensions with negligible modification between the ships of this class.¹⁶ Therefore, some amount of design interface in the form of standardization must have been available to the shipwrights at Skenesborough. The design of the gondolas was not limited to written form as it could have been transposed laterally from near-finished gondolas to the next to be built while upon the Skenesborough slipways.

The gondolas provided only crude shelter, having one awning amidships that covered about half the boat area. A gondola crew of forty-four men would have been hard pressed to each gain a spot under the awning. They were therefore alternately exposed to sun, rain, wind, and mosquitoes. A two foot square brick fire pit was all that was available for cooking and warmth. However, when at general quarters, there was ample room for movement aboard fore to aft and between gun stations when the men were at their watch stations.¹⁷ The gondola's ergonomics while in battle were satisfactory, which more than made up for their lack of creature comforts.

Maintenance Planning

If there was an element of logistics that the Americans were lacking in, it was maintenance planning. One could, however, allow for this shortcoming given the circumstances. The Americans were building a fleet in the wilderness with very little time to complete their mission.

The maintenance of their fleet would have to be left mostly to chance and to on-the-water improvisation. Since the fleet was built with newly felled, unseasoned timber, the wooden members of the ships would inevitably warp, shrink, and bend, leading to leaking.

The American fleet had been deployed on the lake with men living on their boats since 22 August.¹⁸ After forty days of deployment, Arnold's maintenance problems became more problematic. Arnold sent a supply requisition to Gates on 1 October which included needs of three anchors of varying weights with cables, four sets of caulking irons, six pounds of twine, two dozen sailing needles, a barrel of pitch, a barrel of tar, one hundred pounds of spikes, two casks of nails, six coils of line, and "all the old junk that can be spared." (sic)¹⁹ Clearly his ships were falling apart at a critical time. Gates' reply two days later noted that none of the nautical maintenance items that Arnold requested were available in theatre and that on this point he should "Be satisfied."²⁰ He understood that if the motley American fleet could only be kept lake worthy until the end of the month, the waters would begin to freeze, denying the enemy any movement until the spring.

Manpower and Personnel

Manpower was continually a problem as other theatres, particularly George Washington's defense of New York, always demanded the greater amount of men. The Americans had no allies, either with European nations or with indigenous tribes.²¹ Therefore, their manpower requirements would have to be met from their army at hand or the nearby colonies themselves. The men they received had to volunteer for the cause either for patriotism or pay. Potentially half of the available able adult men in the colonies were Tories or neutral bystanders, and therefore unavailable.²² Due to distances of travel and the provincial concerns of each of the

individual colonies, men would be ordered from each of the New England Colonies, New York, New Jersey, and Pennsylvania.

Military Personnel

Warfighters required included ship captains, naval gunners, sailors, marines, and soldiers. Hunters and laborers also had to be drafted or assigned. For all hands, twelve hour work days, seven days per week, were the regimen for the entire campaign.²³

The fleet consisted of seven hundred fifty-four men, many of whom were soldiers from the army who either volunteered or were impressed by Gates and Arnold to serve aboard. To entice soldiers to volunteer as seamen or marines, the Continental Congress authorized additional pay of eight shillings per month.²⁴

One method of finding qualified tradesmen to do the necessary work of the army was polling the troops on what work they were experienced in during their civilian lives. On several occasions, Gates and Arnold identified soldiers as valuable tradesmen and put them to work as required. For example "The General orders Lt. Hoit with fourteen men that understands brickmaking to parade tomorrow morning at six O'clock at the General's Quarters, there to receive instructions." (sic)²⁵ Carpenters, blacksmiths, and tinsmiths were also drafted from the army's ranks in a like manner.

Civilian Personnel

Tradesmen required included teamsters, axmen, boatmen, rapids and portage pilots, shipwrights, sail makers, ship-riggers, coalers, rope makers, shingle makers, miners, coopers, sawyers, wheelwrights, gun-carriage makers, armorers, shingle makers, brickmakers, masons, and millwrights. In the wilderness, tradesmen such as these were difficult to find locally or

entice to come north to support the army. However, by 12 July Colonel John Trumbull reported from Ticonderoga that “We have Carpenters, shipbuilders, & Blacksmiths in plenty.” (sic)²⁶

The tradesmen most required on the lake were shipwrights. Washington polled his army for “Carpenters, Ship-Carpenters and Joiners...and fifty good ax-men” to be identified to march north for the shipbuilding efforts.²⁷ There was very little to entice a shipwright from their ports and docks on the coast as they made high salaries working on ships at home. Congress took action on 3 July by appropriating extraordinary pay and benefits for shipwrights to go to Skenesborough. For pay they were to receive \$34.67 per month, making them the highest paid men in the Navy, save Commodore Esek Hopkins, the Continental Navy’s top ranking officer. This was more than twice the pay of an ordinary navy carpenter at the time. In addition they were to receive 1 ½ rations per day, a ½ pint of rum per day, and a day’s wage for each twenty miles traveled to Skenesborough. Carpenters of any sort, many of them house carpenters, were already at the lakes by 30 May.²⁸ As early as 20 July, shipwrights started to arrive from the seacoast, enticed by the enhanced pay. By the end of July, two hundred shipwrights, along with sixty-five blacksmiths, were working at Skenesborough.²⁹

Supply Support

In the settlements around Skenesborough and Fort Edward the land provided many provisions. Tall stands of timber were common. There was no lack of wood for construction of buildings, shipbuilding, or fueling the forges.³⁰ (The one obstacle was that all the wood was unseasoned as very little had been pre cut the previous year.) Fish, venison, and small game could be found in the wild. Other provisions such as hogs, sheep, beef, corn, wheat, flax, hemp, skins, and grass forage could be obtained from local farmers and settlers.

In order to restore and maintain the health of the army, it was absolutely critical that good food and medicines be procured and transported to the troops. Americans needed supplies from outside the operational theatre, which included but were not limited to, bellows for the forge, axes, cordage, nails, pitch, tar, oakum, powder, cannon, ordinance, barrels of pork, pump boxes, clothing, blankets, rum, beer, spades, sail cloth, blocks, money, whipsaws, files, and lead. But of all these items, the most asked for item was nails.³¹

During the construction of the *Philadelphia II*, an exact replica of the 1776 *Philadelphia* gondola raised from Lake Champlain in 1935, nine thousand nails were needed to finish her.³² Assuming at least a like number of nails were required to construct the larger row galleys, and knowing that twelve ships were launched from Skenesborough in 1776, over one hundred thousand nails had to find their way to Skenesborough or be made there. Fortunately, Harmanus Schuyler managed the facilities at Skenesborough to make nails supplemented by shipments from forges in Albany arranged by Captain Varick.

Clothing was an important commodity in colonial America and one that had to be supplied to the sailors and soldiers. Arnold wrote to Gates on 1 October that a "Great part of my seamen and marines are almost naked. The weather has been very severe for some time." Gates quickly forwarded "All the cloathing we have" to the fleet which Arnold replied was "a sufficient supply of the kind."³³ Gates was able to supply this critical item before the cold winter set in and more importantly, just prior to the impending battle.

Bar iron was another item in short supply. Iron was necessary for the shoeing of horses, making of nails, and fabrication of naval items such as pad eyes, cables, and anchors. Harmanus Schuyler continually sent requisitions for this essential material. Some of the iron that he needed was cannibalized from the one hundred fifty tons of bar iron ballast on the two unfinished

frigates being built at Poughkeepsie.³⁴ Since the British taking of New York, General Schuyler and Captain Varick had determined that their critical naval supply support efforts must be directed towards Lake Champlain in lieu of the now-blockaded Hudson River. The Poughkeepsie frigates stripped of rigging, cordage, and cables, provided a significant amount of naval stores to the fleet at Lake Champlain.³⁵

Support and Test Equipment

The most versatile and most necessary piece of support equipment was the bateau.³⁶ At the beginning of the campaign, there were at least one hundred thirty-seven operational bateaux built by the Americans on the lakes.³⁷ The bateau was a near flat-bottom, double-ended, shallow-draft, all-purpose cargo boat. Bateaux were the most common and most important cargo carrier employed on the inland waters of the colonies. Lengths of twenty-four to forty-five feet with beams ranging from three to six and one-half feet were available, though a thirty foot bateau seems to have been the average length vessel in the campaign area. Bateaux were propelled by manpower with oars or poles in shallow water. In some cases, makeshift sails could be raised for propulsion if the wind was dead astern. Bateaux did not have a rudder as an oar or pole could provide for steerage. Thirty-two to forty men could be carried in a bateau devoid of cargo. A minimum of five men were required to pilot a bateau, four at the oars and one aft to steer. Bateaux were built to carry loads of specific size calculated in multiples of barrels. With a minimum crew of five, a bateau could carry up to thirty barrels, depending on the contents, or about two tons of freight.³⁸

Technical Data

While in Canada, Arnold was designing an American fleet for the lakes. In his own hand he had drawn "dimensions for two gondolas to be built at Chambly."³⁹ He also drafted

specifications for the gondolas that were very nearly followed by the shipwrights at Skenesborough.⁴⁰ Though these drawings and specifications do not survive, they undoubtedly were employed as “blueprints” for the eight gondolas that would be built at Skenesborough during the campaign. It also shows that Arnold had the foresight to have the appropriate technical data available to the army for the coming campaign. The armament for the gondolas included a twelve pound bow gun and nine pound guns both port and starboard. They also included eight swivel guns that fired grapeshot as anti-personnel weapons. This weapon spread was the maximum amount of firepower that could be carried on deck given the size of the gondolas and allowed for firing in any direction except astern.

Arnold also proposed another, more deadly class of warship for the lakes, known as a row galley. Based largely on the Mediterranean row galleys of antiquity, these ships had many advantages over the previous class of gondolas. Powered by oars or wind, they were rigged with two lateen sails allowing steerage regardless of wind direction. They were also armed with heavier guns and more of them. Their low profile made them hard targets. The hull’s small sail area in profile and additional oar ports (thirty-six oars vice twelve on the gondolas) made them much more maneuverable.

The three row galleys finished in time for the Campaign were the *Congress*, *Washington*, and *Trumbull*. Each of these ships was of a different size, with keels varying from sixty to seventy-three feet and beams ranging from ten to nineteen feet. These different sizes are perhaps evidence that there was no uniform technical data available for these ships save Arnold’s general specifications given verbally to the shipwrights for a “Spanish galley,” a craft Arnold was likely to have encountered during previous merchant voyages at sea. Each shipwright custom made the galleys he was in charge of.⁴¹ Arnold ordered the shipwrights “...to begin four row-galleys,

nearly of the construction of those built in Philadelphia.” There were shipwrights that came to Skenesborough from Philadelphia and whether they brought written plans with them or directed the construction of their ships from memory, technical data was applied to their final products.

Training and Training Support

The Americans did not have many trained naval gunners. Arnold pleaded with Schuyler for more seaman and gunners.⁴² Even if he had gotten more gunners, with lack of powder, Arnold could not afford live fire exercises. He did, however, train his men on the procedures, handling and manning of the weapons. “The Men are Daily trained to the Exercise of their Guns, & if Powder was plenty I would, wish to have them fire at a Mark with their Great Guns Often – at present we cannot Aford it.” (sic)⁴³ Arguably, Arnold was the Americans’ most expert naval gunner. During the Battle of Valcour Island, Arnold primed, aimed, and fired the guns on his flagship gondola *Congress* himself.⁴⁴

What today would be referred to as “on the job training” was the only training mode that the Americans had time or resources to conduct. It must have been conducted with some efficiency. During the evening of 11 October after the Battle of Valcour Island, Arnold was able to lead his battered fleet and escape under cover of darkness by sail and oar undetected past the British fleet. This maneuver could only be conducted by men who had learned to pilot their vessels in the most adverse of circumstances. There were some trained seamen aboard the fleet but the majority of the men had been impressed by Arnold and Gates to serve on the ships.

Packaging, Handling, Shipping, and Transportation (PHS&T)

Packaging

The barrel (also known as a cask or hogshead) was the sea van of the age. It was the packaging for most anything from foodstuffs such as pork or corn, general supply such as nails.....

or powder, to liquids such as rum or beer. It had a liquid capacity of sixty-four gallons on average. Barrels for dry goods were usually made of pine and those for liquids of oak. Both species were in ready supply around Lake Champlain. Barrels were made by tradesmen known as coopers and there is evidence they were employed at Skenesborough in 1776. Coopers would have been necessary for the making of new barrels and the repairing of old ones.⁴⁵

Since there was a severe lack of maneuvering room for the men aboard Arnold's fleet, especially aboard the gondolas, it's safe to assume that once a barrels contents were expended, the barrel would be jettisoned. There's no mention in the writings of the day of barrels being returned to the supply depots from the fleet or expectations of their return.

Handling

Considerable care was taken in loading Bateaux. Barrels were laid on their sides and cushioned on a bed of fascines or loose brush that was placed in the bottom of the bateau. Care was taken that none of the barrels placed in bateaux stood on their heads. Additional protection, on a case by case basis, could be had under a water-proof covering such as canvass or oil cloth.⁴⁶

Shipping

Shipping by boat along waterways, if the ice was broken, was always the quickest and least expensive mode of transportation. Boat conveyance also reduced expenditures in manpower for road maintenance.⁴⁷ The bateau was the essential craft. Other shipping modes available included courier afoot or mounted, ox or horse drawn carts, and canoes.

Transportation

Wilderness surrounded the lake with negligible white settlement. No roads or ports were along the lake. Therefore, no army could transit this region without boats to carry them.

The American transportation network in theatre included the employment of several different tradesman and modes of transportation. During the campaign season of April to November a supply item required by the Americans would take the following representative journey: The item could be manufactured anywhere in the world (outside the British Empire) and be transported to Albany via ocean going vessel. (After the Royal Navy sailed into New York harbor on 29 June, the supply item would most likely have to be indigenous to the colonies.) From Albany, river men on bateaux would continue to carry the item along the rapid strewn Hudson, around several portages, as far north as Fort Edward.

Fort Edward was known as "The Great Carrying Place" as the Hudson north of here was non-navigable. A decision would have to be made here as two road routes north were available, one to Lake George and one to Fort Ann. The road to Fort George was the better road and could be used by teamsters. It was a seventeen mile military road built in 1755 as a supply route to Fort George at the southern end of Lake George. At Fort George, the item would be loaded again onto bateaux for the trip north on the lake to Fort Ticonderoga. The advantage of this route was that large quantities could be taken over this route via wagons and bateaux.

The twelve mile "road" to Fort Ann was more of a trail, often in bad repair, and could only be taken by men on foot or on horseback. It was impassable for wagons and not to be counted on for moving large articles.⁴⁸ Once the item reached Fort Ann, it was again transferred onto bateaux for further movement northward along Wood Creek for twelve miles to Skenesborough. The advantage of this route was it was the shortest to Skenesborough, the Champlain valley, and the operational theatre. It was ideal for couriers and small companies afoot. The Americans employed both routes north as avenues of supply based on their needs and the capacity of roads.

The route via Fort Ann was in such need of improvement and of such importance, the Continental Congress took notice. On 17 June 1776, Congress resolved "That General Schuyler be directed to make a good wagon road from Fort Edward to Cheshire's (Fort Ann); to clear Wood creek, and to construct a lock at Skenesborough, so as to have a continued navigation for bateaus from Cheshire's into Lake Champlain."⁴⁹ This was the first specific highway building proposal by the U.S. Congress.⁵⁰

Facilities

The limits of settlement for each side were at the extreme ends of the lake. St Jean's, Quebec was in British hands at the north end of the lake, and Skenesborough was American occupied at the south end. Both towns had shipbuilding facilities and timber resources nearby to build ships. Within a day's march of either town, there were also small farms which could provide food and forage. The Americans had a distinct facilities advantage over the British as there were significant existing forts, mines, and buildings within their interior lines.

Fort Crown Point

Upon the evacuation of Canada, the American sick and wounded, including those infected with small pox, arrived at Crown Point on 1 July. On 7 July a council of war was held here by all the general officers of the Northern Department. It was determined to abandon Crown Point and make a defense at Fort Ticonderoga. The small pox victims would be sent to Fort George where a general hospital would be established.⁵¹

There were two main reasons why the defense of Crown Point was untenable. First, the grounds were exposed to the small pox virus, and any fresh troops sent there without inoculation or previous exposure to the disease risked certain sickness and possible death. Second, it was of such disrepair after a major fire in 1773 that it could not adequately barracks the soldiers or

provide for defensible works. The Americans who had occupied Crown Point since May 1775 made no efforts whatever to repair or rebuild the fort. Crown Point became an oar making station with a small scouting garrison whose purpose was a way station for supply and communication between points up lake and the fleet.

Fort Ticonderoga

Fort Ticonderoga was known as "The Gibraltar of America" and was the largest and most significant facility available to the Americans during the campaign. Its seizure by Arnold and Colonel Ethan Allen on 11 May 1775 had been a source of great pride throughout the colonies. Built by the French in 1754 for defense of its possessions in Canada, most of Ticonderoga's works faced south from where their British enemy would march. This was a disadvantage as the Americans would employ it to defend against a British army approaching from the north in Canada. Fort Ticonderoga was in a state of disrepair in 1776 as well. The French had tried to destroy the fort during their withdrawal in 1759, but two outer work redoubts were in good repair and an officers and enlisted barracks within the fort were serviceable. Gates put the men to work at the fort to repair these deficiencies. The one great advantage in the Generals' selecting Fort Ticonderoga to defend New York was it had not yet been infected with small pox. A simple segregation of men took place at Crown Point. The pox exposed and sick were sent to Fort George, and the immune went to Ticonderoga.

Fort Independence

The need for a fort at this location was identified by Schuyler as early as 17 June.⁵² After unanimous agreement at the Generals' council at Crown Point, work on this new fortress began on 11 July. The Declaration of Independence was first read aloud to the soldiers of the Northern Department on 28 July, and the new fortress was soon named for it. This was the only large

facility built by the Americans during the campaign. It was built directly across the lake from Fort Ticonderoga out of "a howling wilderness."⁵³ Together with Ticonderoga, its guns commanded the passage southward along the lake. It was situated above a cliff along the shore. Though the location was chosen primarily as a defensible redoubt and complement to Fort Ticonderoga, it had an additional paramount advantage. With its high cliff face plunging into the lake, it was the most efficient spot in which to lower cannon and mainmasts into position on the completed vessels built at Skenesborough. All of the ships built at Skenesborough were outfitted and rigged here.

Fort George

As a result of the 7 July Generals' council, a General Hospital was established at Fort George for the sick. The fine military road from Fort Edward discussed earlier, would allow supply of the garrison and hospital. Employing Fort George as a defensible redoubt as opposed to a hospital was out of the question. Lieutenant James Hadden of the British Royal Artillery passing through during the 1777 campaign remarked "Fort George, which stands near the water at the end of the Lake, is a small square Fort face with Masonry and contains Barracks for about a hundred Men secured from Cannon shot." (*sic*) There is no known record of the British or the Americans making an effort at enhancement or repair since the time of the French and Indian War. In any event its small size would not have accommodated the American Army or have deterred the British from moving against it as they did in the following year's campaign.

This ancient and untenable "fort" however, was an ideal place to quarantine all those infected or recovering from the pox. It was far from any permanent civilian settlements, it was serviceable by military road to the Hudson Valley for supply, and most importantly, it was thirty miles away from the pox-free American garrison at Ticonderoga. Nearly three-thousand sick,

pox infected soldiers were sent from Crown Point to Fort George the first of which arrived on 13 July. Since it was only a week before that the decision had been made to make Fort George a general hospital, no shelter (save the fort's 100 man barracks) were available upon their arrival. Fortunately, since it was summer, the Americans could get away with building facilities of a less permanent nature such as tents and lean-tos to house the sick.

Cheever Iron Ore Mines

Forty lake miles north of Skenesborough, near present day Port Henry, NY, were iron ore mines worked at least since 1766 by slaves of a local Tory named Philip Skene. Near the mines was a settlement called Raymond's Mill run by Skene. Along with the mill, there were several houses, huts for the slaves, and a wharf for loading ore onto scows bound for Skene's forges at Skenesborough.⁵⁴ In these early days, this mine had such plentiful ore that one could go to the mine, pile the iron onto a sled, and drag it to the wharf.⁵⁵

A significant amount of ore needed by the American army and its shipbuilding program came from these mines and was worked at Skenesborough. Cheever was a very convenient source of metal ore in the operational theater. The existence of these natural iron deposits within American lines complemented the supply of bar iron sent forward from the Hudson Valley.

Skenesborough

The most significant town in theatre was Skenesborough. It had been a planned settlement by Major Philip Skene, a British serving officer in the French and Indian War. Settlement and improvement of the town began in 1759. Skene was in the Atlantic returning from business in London when Arnold seized the town and Skene's property in May 1775. The existing facilities at Skenesborough proved an invaluable asset to the Americans. The Americans would have had little chance of success without these facilities.

Facilities that existed at Skenesborough in 1776 included a shipyard with as many as four slipways, blockhouse and barracks, a framed mill dam, a sawmill, a stone gristmill, a forty-six foot square bloomery, a coal house, a limestone barn, an Episcopal church, a post office, and Skene's own two and a half story home. There were also scores of houses that Skene's tenants, workmen, and slaves occupied.⁵⁶

The iron works at Skenesborough were arguably the most important facilities in the operational theatre. "A most complete bloomery for constructing bar iron of four fires and two hammers with its implements" existed there.⁵⁷ A bloomery could produce bar iron directly from iron ore. This was a necessity if the Cheever ore was to be of any value since no furnace capable of smelting the ore into pig iron existed north of Albany. The "two hammers" were hearths where the bar iron produced in the bloomery was shaped into finished products. This direct step process (ore to finished product) had the advantage of not requiring additional facilities of a furnace to smelt ore into pig iron and a forge to work the pig iron to bar iron. However, its disadvantage was a small rate of output. Twenty pounds of bar iron can be made every four hours in one bloomery fire.⁵⁸ Harmanus Schuyler ordered work at the bloomery around the clock, therefore its peak output was four hundred eighty pounds of bar iron per day. This explains his continual request for bar iron from points south to supplement what they could make at Skenesborough.⁵⁹ Iron was the critical path material needed for shipbuilding. Commenting on the importance of blacksmiths, Harmanus Schuyler noted on 25 August, blacksmiths were "the greater part of them sick so that they are not able to make the iron work as fast as the Carpenters use it."⁶⁰

However, by the end of the campaign, there were over twenty tons of bar iron available at the Skenesborough bloomery.⁶¹ This is a testament to the capacity of this key facility, the leadership

of Harmanus Schuyler at the bloomery, and Captain Varick's supply support efforts conducted in Albany.

The Americans added to the existing facilities by building a new sixteen by ninety-six foot barracks with twelve sleeping rooms. It's probable that these barracks provided housing for the civilian shipwrights and blacksmiths that arrived for the shipbuilding program. There was no appreciable military manpower footprint in Skenesborough excepting the officers supervising ship construction.

Fort Ann (Cheshire's Mills)

Skene had also constructed a sawmill and blockhouse along Wood Creek about twelve miles south of Skenesborough. Near the confluence of Halfway Brook and Wood Creek was a forty foot waterfall that powered the mill on the brook. The mill complemented the sawmill at Skenesborough for supplying planks to the fleet and for facilities repair and construction. Milled wood products were floated or rowed to Skenesborough downstream on Wood Creek. Wood Creek was navigable by bateaux.

Fort Edward

Fort Edward was known to the Iroquois as "The Great Carrying Place." This was the terminus of waterborne transportation due to falls and rapids north of Fort Edward on the Hudson. The transition of goods from one mode of transportation to another (waterborne to land borne) occurred here. It was also a crossroads of sorts with the Hudson flowing south towards Albany, and the roads discussed earlier headed to Forts George and Ann.

Shortly after the French and Indian War, the fort was abandoned, supplies moved, fortifications dismantled, and the rest left to decay. Many of the old fort timbers were used by residents to build their own homes. There was still a barely serviceable barracks at the Rogers

Island portion of the old fort. With the fortifications in ruins, Fort Edward was an indefensible post.

Strategic Result of the Campaign

The British conducted an offensive campaign.⁶² Their initial objective was to defeat the American garrison at Ticonderoga and take the fort. Once taken, the British planned to either winter at the fort or proceed south to Albany, weather permitting. Since Albany was along the tidal Hudson, the British could count on resupply from Royal Navy vessels out of New York if they could reach this objective. In order to meet their strategic objective of driving south towards Albany and a potential meeting with Howe's Army from New York, they had to defeat any Continental forces opposing them on Lake Champlain. This required a fleet of ships to be built upon the lake.

Since the British intended to launch an offensive campaign, their center of gravity was their navy upon the lakes. That navy was necessary to move their army south given the limits of geography discussed earlier. Arnold deployed his forward screening navy engaging directly with the British center of gravity some sixty lake miles away from the American center of gravity at Fort Ticonderoga. Arnold's fleet was an expendable force. For these reasons, the Americans had some measure of strategic advantage.

The fleet built by the Americans was most importantly a fleet in being. It consisted of the newly launched eight gondolas and four row galleys as well as the four ships that existed at the beginning of the campaign.

The campaign climaxed at the Battle of Valcour Island on 11 October. The Americans performed a brilliant feat of joint operations as Arnold deployed his fleet to maximum advantage. By anchoring his fleet in the hidden lee of Valcour Island, he forced the British ships

of sail to tack upwind in order to engage. The British sailing ships were unable to maneuver upwind therefore, only the single gun boats, twenty-four in number, could be rowed within range. The British had the advantage of better trained naval gunners. Their guns sank two gondolas, forced the Americans to abandon two gondolas due to battle damage, and allowed the capture of another the next day. Two American ships ran aground. The British lost only one gun boat.

During the battle and following naval actions through 13 October, the American fleet was defeated and largely destroyed. Only four of the fifteen vessels in the American fleet survived the engagements as Arnold was forced to scuttle four ships at Ferris Bay in Panton, VT on 13 October. However, this tactical naval victory by the British came too late in the year to be of any strategic value. The British consumed nearly the entire campaign season building ships to combat the American fleet and to transport their army south. With the onset of winter, the British withdrew from the lake back to St. Jean's on 2 November. The British therefore failed in their strategic objective of splitting the colonies in two employing the Lake Champlain – Hudson River corridor. This delay in the British advance gave the Americans an additional year to re-organize and re-fit. The next campaign season culminated in the British defeat at Saratoga.

Lessons for the contemporary logistician

Standardization of a weapons platform is an important design interface component. It allows for the expeditious construction of a class of platform after the initial platform is completed. Lessons learned from previous builds can be quickly transposed to the next. Resist the temptation to modify the design or add capabilities not hitherto planned for during a government acquisition. Harmanus Schuyler was able to supervise the building of eight gondolas in as many

weeks due in no small part to their commonality and simple design. These vessels became the most numerous class of warships on the lake in 1776.

Maintenance planning of a newly fielded platform or item is not an exact science. For new developments, expect some gaps in maintenance. Anticipate the end user to provide feedback which includes a long list of items not previously planned for that are necessary for the proper maintenance of the item. A demand for earlier delivery from the contractor, even with an award, can result in a less than desirably maintained deliverable. In 1776, very highly paid carpenters and shipwrights performed outstanding work within a very small work window creating warships at the rate of one per week. But their boats leaked.

It's rare that a commander has all of the qualified personnel that he or she requires to complete a mission. Your personnel roster will list those persons, both military and civilian with defined skill sets, and documented training. Get to know your personnel, by one on one interviews if necessary. Find out what their interests or hobbies are. Learn what skills they have that they picked up outside of your organization. Gates and Arnold were able to cobble together the first carpenters and blacksmiths at Skenesborough just by polling their soldiers on what civilian trades they were proficient in.

Take the time to discover those items of supply that can be found in your local area. Include government and industry sources. This is all the more important given present high fuel costs. Your supply support will then become less expensive, timelier, and require less transportation. Localized personal relationships can also be developed that can keep one informed of nearby inventories and developments. The American forces were blessed with abundant food and fuel supply nearby their facilities that allowed them to focus on enhancing their readiness to meet the enemy.

Become familiar with all of the varying methods in which one can train the end user on the newly acquired system. For reasons of economy or location, live fire exercises may not be feasible. Arnold's seamen and marines were able to repeat the procedures for firing their cannon without actually doing so. Constant repetition of immediate actions by operators is essential to training success.

Know your facilities, their capacities, and locations. Walk those facilities. It's one thing to view a plan of a space, it's another to visit it and see what its potential is with your own eyes. Schuyler, Gates, and Arnold were able to determine, after becoming familiar with each of their facilities, which of them could be used (Fort Ticonderoga and Skenesborough), where there was a need for new ones (Fort Independence) and those that could be abandoned (Crown Point).

Know how your supply gets to you. Learn what modes of transportation you will have to rely on and the advantages and disadvantages of those modes. The supply routes should be known and studied with attention paid to chokepoints. At any point where a supply item changes modes of transportation, it will add friction to and possibly frustrate the shipment. Discover and propose alternate routes of transportation. Recognize the transportation routes where frustrated freight is common. There were two routes to Fort Ticonderoga in Upstate New York in 1776. Depending on what or whom needed to be sent forward, a proper choice could be made on the most feasible and expeditious route.

Conclusion

Schuyler, Gates, and Arnold were able to correctly frame the nature of the problem in front of them and choose the ground to make their defense. Their enemy, a large, capable, well trained naval force, was likely to employ Lake Champlain as an invasion route into New York during the campaign season of 1776. They were therefore able to identify solutions to the problem.

Fort Ticonderoga was proposed as a key defensive position. A fleet in being was built at Skenesborough in order to counter the British warships being constructed in Canada. The building of the American fleet necessitated the movement of naval logistics products into theatre or the creation of them locally. As the method for their success, the American fleet was deployed as a forward screen to meet the British advance. The Americans were therefore able to realize their desired end state: a successful defense of New York.

The Americans' logistical position in the Northern Theatre in 1776 gave them operational advantages that the British were unable to counter. The Americans earned a logistical advantage over the British leading to their success during the Northern Campaign of 1776. American logistics success denied the British any strategic advance over the campaign season thus, earning the Americans another year to reorganize and refit.

Appendix A: The Ten ILS Elements Defined⁶³

Design Interface is the relationship of logistics-related design parameters to readiness and support resource requirements. Logistics-related design parameters include the following: reliability, maintainability, human factors, safety, survivability, vulnerability, standardization, interoperability, corrosion, nondestructive inspection, and transportability. These logistics-related design parameters are expressed in operational terms rather than inherent values. Design interface really boils down to evaluating all facets of an acquisition, from design to support and operational concepts for logistical impacts to the system itself and the logistics infrastructure.

Maintenance Planning establishes maintenance concepts and requirements for the life of the system. It includes, but is not limited to, levels of repair, repair times, testability requirements, support equipment needs, manpower skills, facilities, repair responsibility, site activation, etc. This element has a great impact on the planning, development, and acquisition of other logistics support elements.

Manpower and Personnel involves the identification and acquisition of personnel (military and civilian) with the skills required to operate, maintain, and support systems over their lifetime. Early identification is essential. If the needed manpower is an additive requirement to existing manpower levels of an organization, a formalized process of identification and justification must be made to higher authority. Add to this the necessity to train these persons, new and existing, in their respective functions on the new system, and the seriousness of any delays in the accomplishment of this element becomes apparent.

Supply Support consists of all management actions, procedures, and techniques necessary to determine requirements to acquire, receive, store, and issue spares, repair parts, and supplies. This means having the right spares, repair parts, and supplies available, in the right quantities, at the right place, at the right time, at the right price. The process includes provisioning for initial support, as well as acquiring, distributing, and replenishing inventories. Keep in mind that cannon can be made useless just as quickly for not having fuses as not having balls.

Support and Test Equipment is made up of all equipment (mobile or fixed) required to support the operation and maintenance of a system. This includes ground handling and maintenance equipment, tools, and manual test equipment. During the acquisition of systems, program managers are expected to decrease the proliferation of support equipment into the inventory by minimizing the development of new support equipment and giving more attention to the use of existing government or commercial equipment.

Technical Data represents recorded information of technical nature (such as books and drawings). Books may provide the instructions for operation and maintenance of a system.

Training and Training Support consists of the policy, processes, procedures, techniques, and equipment used to train military personnel to operate and support a system. This includes individual and crew training, new equipment training, initial, formal, and on-the-job training. The greatest amount of training is accomplished just prior to the fielding of a system.

Computer Resources Support is not applicable to this paper.

Facilities consists of the permanent and semi-permanent real property assets required to support a system, including facility improvements, location, space needs, environmental requirements, and equipment. Certainly, the unavailability of facilities can be just as damaging to a system as would be the lack of spare parts, trained personnel, or support equipment. A last minute decision to deploy a system to a different locale may require extraordinary efforts to correct facility delays.

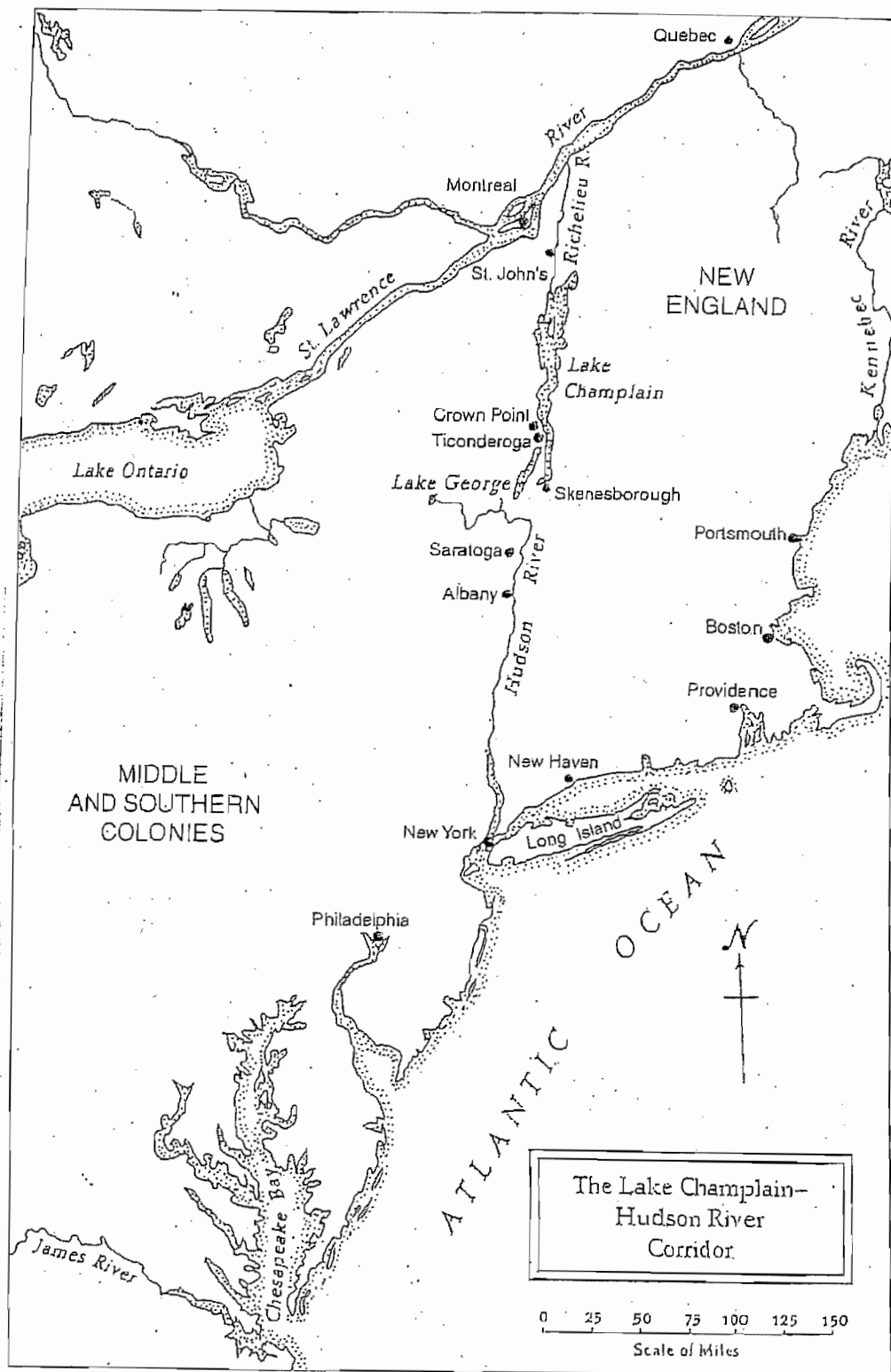
Packaging, Handling, Storage, and Transportation (PHS&T) is the combination of resources, processes, procedures, design, considerations, and methods to ensure that all system, equipment, and support items are preserved, packaged, handled, and transported properly, including equipment preservation for the short and long storage, and transportability.

Appendix B: Northern Campaign of 1776 Timeline of Key Events

Date (1776)	Key Event
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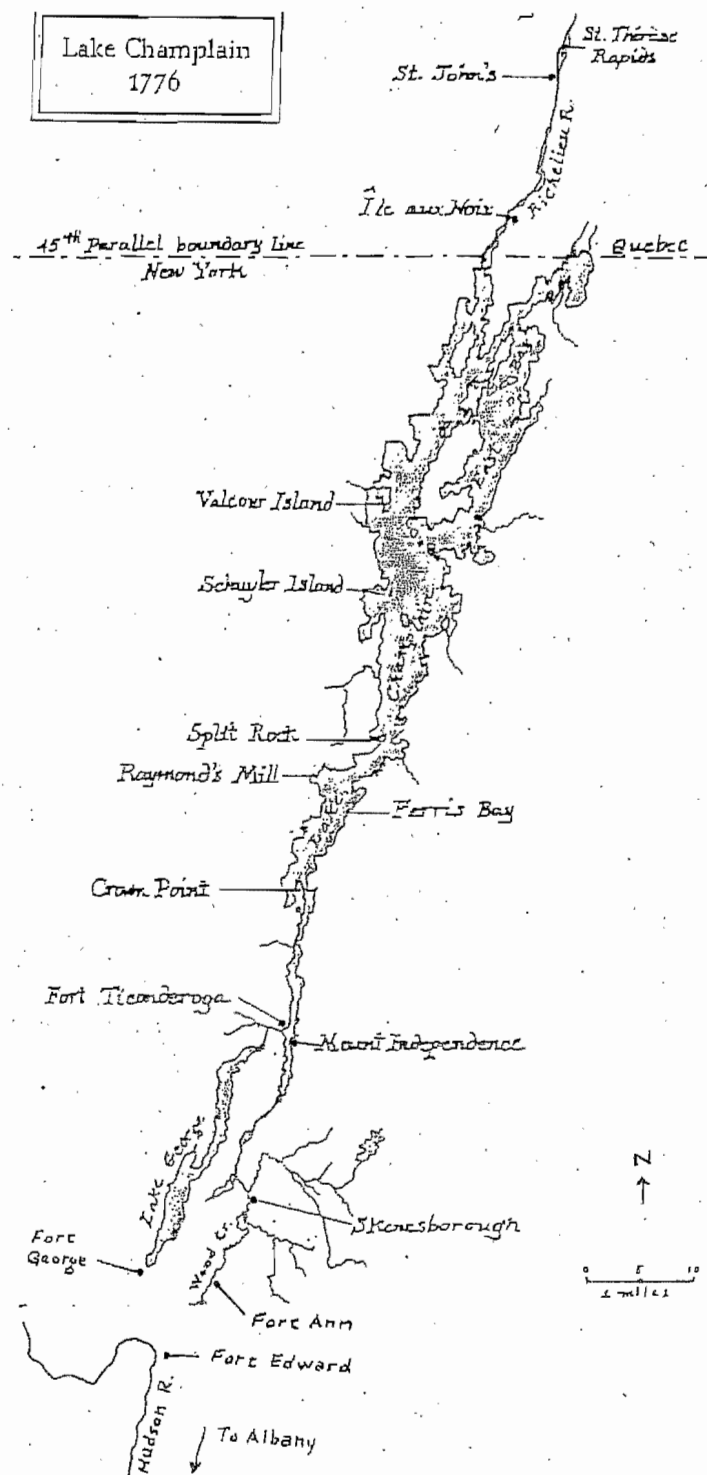
18 June	Arnold and Americans abandon their last military position in Canada at St. Jean's.
2 July	Last of small pox ridden American Army leaves Ile aux Noix, Quebec unopposed.
3 July	Continental Congress orders dispatch of ship tradesmen to Skenesborough.
4 July	Declaration of Independence.
22 August	American Fleet deploys from Ft Ticonderoga.
23 September	Arnold scouts and chooses the lee of Valcour Island as an anchorage for battle.
9 October	British Fleet deploys into Lake Champlain.
11 October	Battle of Valcour Island.
12 October	Arnold's ships pass The British fleet undetected and sail south for Crown Point.
13 October	Pursued by the British, Arnold scuttles the majority of his fleet on the VT shore.
2 November	With the onset of winter, Carleton abandons Crown Point for St Jean's.

Appendix C: Strategic Campaign Area: The Lake Champlain – Hudson River Corridor



Map by Lucy B. Carver, Lake Champlain Maritime Museum

Appendix D: Operational Campaign Area: Lake Champlain – 1776



Map by Lucy B. Carver, Lake Champlain Maritime Museum, with additions by author.

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Notes

¹ *Birth of the United States Navy, Whitehall, New York*, Doris Begor Morton, p.5, The *Liberty* was the U.S. Navy's first warship and Arnold's action at St. Jean's was the first U.S. Navy amphibious landing on foreign soil.

² Lord George Germain to General John Burgoyne, 23 August 1776 *Benedict Arnold, Patriot and Traitor*, Willard Randall, p. 247.

³ "You will most religiously observe that it is my positive Order...that the Preventing of the Enemys invasion of our Country, is the ultimate End of the important Command, with which you are now intrusted. It is a defensive War we are carrying on; therefore, no wanton risque." (sic) Horatio Gates' (HG) Orders to Benedict Arnold (BA) 7 August 1776, Horatio Gates Papers, New York Historical Society, Copy at USMA Special Collections and Archives.

⁴ "General Return of the Forces of the United States of America, Serving in the Northern Department under the Command of Honourable Major General Gates, Ticonderoga, September 29th, 1776"(sic) Fort Ticonderoga Museum Bulletin (FTMB), Vol. IV, July 1938, No. 7, p. 23. This return includes all Officers, rank and file, and ineffectives as 12,563 men. Since this is a return of the entire Northern Department, and Arnold had 754 men with the fleet, 11,000 is a good faith estimate of the garrison at Fort Ticonderoga. This assumes approximately 750 men on scout or hunting parties or garrisoned elsewhere in theatre.

⁵ The Defense Acquisition University (DAU) website lists the 10 ILS elements.

⁶ For example, King William's War 1689-1698, Queen Anne's War 1702-1713, King George's War 1744-1748, the French and Indian War 1754-1763, the American Revolutionary War 1775-1783, and the War of 1812 (1812-1815).

⁷ *The American Northern Theatre Army in 1776, The Ruin and Reconstruction of the Continental Force*, Douglas R. Cubbison, p. 131-2 describes in detail the miseries of small pox infection of the American army at Isle aux Noix, Quebec and the retreat from there to Crown Point. It includes primary source letters from anonymous soldiers as well as COL John Trumbull.

⁸ Brigadier General John Sullivan to Major General Philip Schuyler (PS), 19 June 1776, Naval Documents of the American Revolution (NDAR) Vol. 5, p. 613.

⁹ The *Lee* was a row galley built from frames seized from British at St Jean's, numbered, and removed on 18 Jun 1776 as discussed in the Forward of this paper. The *Liberty*, the former *Katherine*, was seized from Tory Philip Skene at Skenesborough on 14 May 1775. The *Liberty* was the first ship in the history of the U.S. Navy. The *Enterprise* was a sloop, the former *Betsey*, seized from the British at St Jean's on 18 May 1775. The *Revenge* and *Royal Savage* were seized from the British at St. Jean's by Major General Montgomery's army in the autumn of 1775.

¹⁰ "The enemy I am well informed have brought (over) a Number (of ships) with them, Framed and done to put up in a short Time." (sic) BA to PS, Montreal, 6 June 1776, NDAR, Vol. 5, p. 389.

¹¹ Randall, p. 247.

¹² FTMB, Vol. XV, Winter 1991, No. 3, Ch. 5 and the Philip Schuyler Papers, Schuyler Mansion, Albany, NY discuss in depth Schuyler's summer mission to the Iroquois.

¹³ Materials Forwarded for Vessels Building on Lake Champlain, New York, 12 May 1776. NDAR, Vol. 5, p. 66-7. This document references Varick's requisition of 2 May which lists rigging, blocks, and line that could only have been used for ships of sail. The British invasion fleet arrived at Quebec on 6 May.

¹⁴ Barent Van Alen's Receipt for Supplies Shipped to Major General Philip Schuyler, 5 June 1776. NDAR, Vol. 5, p. 381. "Junk" was an 18th century term for old rope and line that had frayed to a degree where it was no longer serviceable as line. It would then be broken down into its near individual fibers by hand. This tedious work was often completed by prisoners, old men, or boys. Once broken down, it could be applied as oakum between the wooden seams of the boats to prevent leaking.

¹⁵ PS to Harmanus Schuyler, Heads Qrs, Fort George, 7 June 1776. NDAR, Vol.5, p. 410-11.

¹⁶ The *Spitfire*, one of Arnold's sunken gondolas, was discovered by the Lake Champlain Maritime Museum (LCMM) in 1997 along the lake's bottom. Periodic visits to the *Spitfire* by LCMM divers have confirmed that she is a near exact likeness of the *Philadelphia*, discovered and raised by Colonel Lorenzo F. Hagglund in 1935. "I can tell you that in size, shape and dimension it (*Spitfire*) is very similar, one would say exactly like, the gunboat *Philadelphia*, and I am sure the dimensions are literally within inches. That said, there are some construction differences, i.e. the lodging knees fore and aft on the mast partner are, on the *Spitfire*, just on one side, and the lodging knees on the *Philadelphia* mast partner are on the forward facing edge, but a full scale study has not been completed. I think for all intents and purposes we feel that the eight gunboats were all almost *Philadelphia*-class in terms of size, shape and general dimensions," e-mail of 4 March 2011 from Dr Arthur B. Cohn, Executive Director, LCMM.

¹⁷ Interview on 10 October 2010 with Mr. Dale Henry, LCMM, Shipwright for *Philadelphia II*. *Philadelphia II* is an exact working replica of Arnold's *Philadelphia* sunk at The Battle of Valcour Island. Mr. Henry has sailed overnight with a full complement of 44 men. Of note is how cramped quarters are when 44 men are attempting to find deck space to sleep on. However, based on Mr. Henry's experience placing men at General Quarters, there's ample room for movement aboard fore to aft and between gun stations when the men are at their watch stations.

¹⁸ FTMB, Vol. XII, September 1966, No.2, p.141.

¹⁹ "Memorandum of Articles which have bin repeatedly wrote for, & which we are in the Extreemest, want of." (sic) BA to HG, 1 October 1776, NDAR, Vol. 6, p. 1083-4. In the same letter, Arnold also asks for numerous ammunition and ordnance needs as well as "Rum As much As you please. Cloathing For at least half the Men in the Flet who are Naked. One hundred Seamen, (no land Lubbers)" (sic).

²⁰ HG to BA, 3 October 1776, NDAR, Vol. 6, p.1116.

²¹ Stockbridge Mohican Indians did side with the Americans and provided some warriors to Gates at Fort Ticonderoga but little can be gathered as to their contributions or numbers. They are mentioned in passing in some of the American Officer's orderly books at Fort Ticonderoga in the Summer of 1776 however, they are not included in any returns or are notes made of the missions they were assigned, if any. It's the author's belief that they may have been employed primarily in hunting parties. Hunting, being a necessary activity for provisioning the men, would have best performed by the more proficient Indians, and reserved white men for sundry duties in which communication in English was essential. Fort Ticonderoga Orderly Books (Orderly Books), Pell Research Library, Fort Ticonderoga, NY.

²² "In fact, all of the colonies outside of Virginia and New England—although containing strong patriot parties, animated by the most fiery zeal—were as a whole somewhat lukewarm in the Revolution, for they contained also large Tory, and still larger neutral elements in their midst. If left to themselves it is even doubtful if at this precise time they would have revolted; they were pushed into independence by the Virginians and New Englanders." New York: Sketch of the City's Social, Political, and Commercial Progress from the First Dutch Settlement to Recent Times. Theodore Roosevelt Chap X, p.1.

²³ In his Deputy Adjutant Orderly Books at Fort Ticonderoga, COL John Trumbull, son of Governor Trumbull of Connecticut, writes on 30 July 1776 "Fatigue parties to breakfast before work, work 6 until noon, dinner noon until 1, work until 7." and again on Saturday 21 September 1776 "In consideration of the Troops having been constantly employed in the Public Works every day without intermission ever since their arrival at this camp, the General (Gates) Orders all works, but that for the equipment of the Vessels, Gun Carriage makers, and Black Smiths, to cease tomorrow. Those shall be indulged hereafter" (sic) It's interesting that the shipbuilding and outfitting was of such importance, that Gates did not extend to those working on the fleet, this rare day off of work. Orderly Books.

²⁴ General Order of Major General Horatio Gates, Head Quarters, Ticonderoga, 23 July 1776. NDAR, Vol. 5, p. 1185-6.

²⁵ Colonel Ephraim Wheelock's Regimental Orderly Book, Massachusetts Militia, August 18 – November 26, 1776, Ticonderoga. Orderly Books.

²⁶ COL John Trumbull to GOV Jonathan Trumbull, Ticonderoga, 12 July 1776. NDAR, Vol. 5, p. 1035.

²⁷ General Orders of the Continental Army, Head Quarters, New York, 14 June 1776, NDAR, Vol. 5, p.527.

²⁸ PS to CAPT Charles Don, Fort George, 30 May 1776, NDAR, Vol. 5, p. 307. Thirty carpenters left Fort George for Skenesborough

²⁹ *Benedict Arnold's Navy*, James L. Nelson, p.231

³⁰ Adolphus Benzel reported on the forests along Lake Champlain in 1772 that "for a mile above Kane's Falls at Fort Anne there was mast timber to six feet in diameter upwards and white oak from the diameter of 20 to 36 inches when squared." *Philip Skene of Skenesborough*, Doris Begor Morton, p. 29. Arnold's fleet was framed and planked in white oak with masts of pine.

³¹ PS to GEN George Washington on 11 May, 15 May, and 21 May writes in great distress about his shortage of nails. NDAR, Vol. 5.

³² Interview on 10 October 2010 with Mr. Dale Henry, LCMM.

³³ HG to BA, 3 October 1776 and BA to HG 10 October 1776. NDAR, p.1116-7 and 1197-8.

³⁴ Francis Lewis to Robert Treat Paine, Poughkeepsie, NY 20 May 1776. NDAR, Vol. 4, p. 234. Lewis notes the quantity of bar iron ballast at the time in Poughkeepsie.

³⁵ CAPT Richard Varick to LT (Unknown), 18 August 1776, PS to Committee for Building the Continental Frigates at Poughkeepsie 17 September 1776, Journal of the New York Convention 28 September 1776, PS to John Hancock 3 October 1776. NDAR Vol. 6, p. 224, 872-3, 1033-4, 1117-8.

³⁶ Due to the lack of French speakers amongst writers of the day bateaux will be found to have dozens of variants in spelling such as battoo, bateau, battow, battoe, etc. In French, 'bateau' is the singular and 'bateaux' the plural and therefore, this convention will be used throughout the text.

³⁷ PS to GW, Fort George, 27 April 1776, NDAR, Vol. 4, p. 1284. Schuyler notes the total carried over from the previous year as well as the one hundred the Continental Congress commissioned him to build this season as 137 bateau.

³⁸ *Bateaux and 'Battoe Men': An American Colonial Response to the Problem of Logistics in Mountain Warfare*, p.1-2, Joseph F. Meany Jr., Ph.D., Senior Historian, New York State Museum, September 19, 2007.

³⁹ Randall, p. 246.

⁴⁰ Arnold's specifications, dated 3 May 1776 at Chambly, Quebec are detailed in *The History of American Sailing Ships*, Howard I. Chapelle.

⁴¹ Nelson, p. 268.

⁴² "Memorandum of Articles..." BA to HG, 1 October 1776, NDAR, Vol. 6, p. 1083-4.

⁴³ BA to HG, 21 September 1776, NDAR, Vol. 6, p.926.

⁴⁴ "We suffered much for want of seaman & gunners, I was obliged myself to point most of the guns on board the *Congress*..." BA to HG, 12 October 1776, NDAR, Vol. 6, p.1235.

⁴⁵ CAPT Abraham Lane to BA, Ticonderoga, 19 August 1776. Papiers Benedict Arnold (invasion americaine), Musee de la Civilization, Musee de l'Amerique Francaise, Quebec City. (Papiers)

⁴⁶ Meany, p. 1-2.

⁴⁷ "The expense of Ferriage and the Transportation by Land from hence (Albany) to Fort George runs so amazingly high, that I propose to have the provisions carried partly by water; which will not only make some abatement in the Expende of Transportation, but lessen the Charge we are at in maintaining the Roads." (sic) PS to John Hancock, 7 March 76, Schuyler Papers.

⁴⁸ "With this I forward the Sundry small Articles Agreeable to your memorandum. I am sorry I have not been able to hand them to you Sooner, the Chief reason was that the road to Chasire's Was so bad that the Waggon could not ride that way." (sic) Jacob Cuyler to BA from Albany, 16 August 1776. Papiers. At the height of summer, when this road should have been most passable, it was unusable. This was probably in no small part due to torrential rain. Dr. Lewis Beebe at nearby Fort George remarked in his journal on 19 July "Last evening we had one the most severe showers of rain, ever known; it continued almost the whole night, with un-remitted violence; many of their tents were ankle deep in water."

⁴⁹ Journal of the Continental Congress, Philadelphia, 17 June 1776. NDAR, Vol. 5, p. 589. Work on the Champlain Canal was commissioned by the State of New York, commenced in 1793, and completed in 1822.

⁵⁰ Discovered by the author. Upon review of the Journals of the Continental Congress for all dates prior to 17 June 1776, no direction is given for a major road project.

⁵¹ Resolves of a Council of War Held at Crown Point, 7 July 1776. NDAR, Vol. 5, p. 961.

⁵² PS to GW, Albany, 17 June 1776. NDAR, Vol. 5, p.589.

⁵³ *Diary of Ensign Bayze Wells*.

⁵⁴ *Philip Skene of Skenesborough*, Doris Begor Morton, p. 30.

⁵⁵ Essex County (NY) Historical Society website: <http://www.adkhistorycenter.org/esco/tow/moriah.html>

⁵⁶ *Philip Skene of Skenesborough*, Doris Begor Morton, p. 28-30.

⁵⁷ *Philip Skene of Skenesborough*, Doris Begor Morton, p. 29. Mrs. Morton's primary source for this information was a letter from Philip Skene in the American Loyalist papers of the New York Public Library.

⁵⁸ Interview with Mr. Eric Zieg, Blacksmith, Mount Vernon Estate and Gardens, 12 March 2011

⁵⁹ Harmanus Schuyler to PS, Skenesborough, 24 July, 1 August, and 16 August 1776. George Washington Schuyler Papers, Cornell University Archives. (GWS Papers)

⁶⁰ Harmanus Schuyler to PS, Skenesborough, 25 August 1776. GWS Papers

⁶¹ Philip Skene, a Tory, returned to his manor in Skenesborough with Burgoyne's Army the following year. "To prevent supplies from falling into Rebels' hands, he sent to Ticonderoga all the implements that belonged to the iron works with about 20 tons of bar iron." *Philip Skene of Skenesborough*, Doris Begor Morton, p. 58. This amount of iron was what would have been left over after The Campaign of 1776 had concluded. It's astonishing to think of the amount of iron extracted from the local area was available to the Americans in 1776. This iron would not only be

used in shipbuilding, but in shoeing horses, providing for the maintenance of the forts, building gun carriages, wagon wheels, cannon balls, etc.

⁶² “The rebels are driven from this province, I’m preparing to follow them, and shall send a force to Lake Ontario to penetrate that way also into their provinces.” Sir Guy Carleton (GC) to CAPT Fonter, 20 June 1776, and “...the Rebels are driven out of this province, and I am preparing to return their visit.” GC to CAPT De Peyster, 25 June 1776. Frederick Haldimand Papers, as transcribed by C. E. Pippenger, PhD in 2010.

⁶³ Life Cycle Logistics Chart– ILS Elements, Defense Acquisition University Website. Due to the nature of 18th century logistics, I have modified the contemporary definitions as to leave out terms with no 18th century context such as computers and hazardous material.